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with mathematical honours in 1842. While at college he pulled bow oar in the University eight in two successful encounters with the Oxford crew. In 1844 he was ordained by the Bishop of Norwich, and for some time served the cures of Witton and Brundell, near Norwich. In 1846 he received an appointment as chaplain and naval instructor on board H.M.S. *Hastings*, and left for service on the coasts of South America, India, and China. Afterwards he served in the Baltic, the Mediterranean, and the Crimea, and was successively transferred to H.M.S. *Carysford*, *Duke of Wellington*, *Diadem*, *Immortalité*, and *Racoon*.

In 1866 he was nominated special naval instructor to H.R.H. Prince Alfred on board H.M.S. *Euryalus*, his last service afloat being in the *Ariadne*, in 1868–69, during the visit of their Royal Highnesses the Prince and Princess of Wales to the East, after which he was placed on the retired list, and was appointed rector of Sandringham-cum-Babingley and private chaplain in ordinary to H.R.H. the Prince of Wales, which position he occupied till his death on August 28, 1877.

REV. FREDERIC WILLIAM RUSSELL was born at Norwich on January 30, 1821, and received his early education under the Rev. Charles Turner. He entered University College, Durham, where he took the degree of M.A., in the usual course, in 1847, and four years after was elected a Fellow of this Society. For some years he was arduously engaged in parochial work; but in 1862 he was appointed Chaplain of Charing Cross Hospital. Here he laboured diligently for fifteen years, and doubtless overtaxed his strength. For some time before his death he appeared to be failing, but still kept to his work. He was, however, taken ill in the hospital, and died there on April 9, 1877, after a few days' illness. In 1857 he married Fanny, youngest daughter of Benjamin Standring, Esq., a London merchant. He was Fellow of the Society of Antiquaries, and in 1859 published a work entitled *Kett's Rebellion in Norfolk*. He was much interested in scientific matters, especially in the microscope, and was a Fellow of the Royal Microscopical Society. He has left a widow and six children.

WILLIAM HENRY FOX TALBOT, of Lacock Abbey, Wiltshire, was the eldest son of the late Mr. William Davenport Talbot by his marriage with Lady Elizabeth Theresa Fox-Strangeways, eldest daughter of Henry Thomas, second Earl of Ilchester, and was born in February 1800. He received his early education at Harrow School, and afterwards proceeded to Trinity College, Cambridge. He graduated in 1821 as twelfth wrangler, and obtained the second Chancellor's Medal. In 1820 he had received the Porson Prize for Greek Iambics, which had been founded three years previously. His earliest papers were mathe-

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matical, the first being an extract from a letter addressed to Gergonne containing a solution of a problem which had appeared in his journal: it is printed in vol. xiii. of *Gergonne's Annales* (1822). He seems to have been chiefly interested in theorems involving arcs of curves, of which Fagnani's theorem is the type. Mr. Fox Talbot's name is so completely associated with the invention of photography that his mathematical powers are now almost unknown except to the few mathematicians who have attended to the subject of elliptic functions. In his memoir, "Researches in the Integral Calculus," published in the *Philosophical Transactions for* 1836 and 1837, he gave an account of his investigations upon the comparison of transcendents, which show that he had independently been led to consider the development and generalisation of Fagnani's theorem, and was on the track that might have led him to rediscover Abel's great theorem. As it is, although Mr. Talbot's work was in fact superseded before it was published by the more brilliant discoveries of the Norwegian mathematician, still, had it been published twenty years earlier, it would have made an important extension of the boundaries of mathematical science, and it is probable that Mr. Talbot's researches upon the comparison of transcendents more nearly approached those of Abel than had those of any other mathematician. In later years Mr. Talbot returned to the subject of mathematics, but his recent papers do not appear to be of much importance.

With regard to the invention of photography, Mr. Talbot himself states, in his *Pencil of Nature*, that in the month of October 1833, when trying to sketch the scenery along the shores of the Lake of Como by the aid of a camera-lucida, and wearied by many successive failures, he was "led to reflect on the inimitable beauty of the pictures painted by the hand of Nature, pictures which the glass lens of the camera throws upon the paper in its focus," and, further, "to consider whether it would be possible to make these pictures permanent." By a long and elaborate course of experiments, extending over five years, he had nearly arrived at a result satisfactory to himself, when he read one day, in a scientific journal, that his own solution of the mystery had been, if not anticipated, at all events rivalled by the parallel researches of M. Daguerre. M. Daguerre's account of what was subsequently termed the Daguerreotype process was published in January 1839, and Mr. Fox Talbot lost no time in communicating to the Royal Society, on January 31, 1839, an account of his researches, in a paper entitled "Some account of the Art of Photogenic Drawing; or, the process by which natural objects may be made to delineate themselves without the aid of the artist's pencil," which was published in the *Proceedings* and also in the *Philosophical Magazine* for 1839. The process consisted in treating writing-paper with a solution of common salt, and subsequently with a solution of nitrate of silver, forming chloride of silver on the surface of the paper.

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Lace, leaves, ferns, &c. were laid upon this paper, and after exposure to the light, produced white images of the objects upon a dark ground: these were the negatives, from which positives could be obtained by printing in the manner still employed.

In 1840 Mr. Talbot discovered the Calotype process, the principle of which was that paper rendered sensitive by iodide of silver and nitrate of silver receives, in the first few seconds of its exposure to the light, an invisible image, which can be rendered visible by treating it with a solution of gallic acid.

This Calotype method, which was subsequently named Talbotype, after its inventor, may be regarded as the foundation of the photography of the present day. It formed a complete and perfect process and was largely practised by the early photographic amateurs, some of whom by means of it produced almost as perfect results as have been obtained by the methods invented subsequently. The *Pencil of Nature* referred to above is a fine quarto volume, published in 1844, and is without doubt the first book ever illustrated by photographs. It contains twenty-four photographs, each picture having a descriptive chapter of letter press, and an introduction giving an outline of the process employed and the steps which led to its discovery. Subsequently Mr. Talbot discovered a method by which instantaneous pictures could be taken, and a method of photographic engraving. All these inventions were patented; but in 1852, at the solicitation of the Presidents of the Royal Society and Royal Academy, he consented to throw open his discovery to the world for the sake of advancing the art, with the sole exception of "photograph-taking for sale to the public."

Mr. Talbot also wrote numerous papers upon such various subjects as light, spectrum analysis, heat, electricity, crystallography, and even botany.

In 1842 he read, at the British Association, a paper "On the Improvement of the Telescope," and in the British Association Report for 1871 there is a short paper by him "On a New Method of Estimating the Distance of some of the Fixed Stars." He was also one of the first who, with Sir Henry Rawlinson and Dr. Hincks, deciphered the cuneiform inscriptions brought from Nineveh, and he made numerous contributions in literature and archæology to the Royal Society of Literature and to the Society of Biblical Archæology. Besides the *Pencil of Nature*, he published *Legendary Tales; Hermes, or Classical and Antiquarian Researches; The Antiquity of the Book of Genesis illustrated by some New Arguments;* and *English Etymologies.*

Mr. Talbot was one of the oldest members of this Society, having been elected on December 13, 1822. He was elected a Fellow of the Royal Society in 1831, and received a Royal Medal in 1838 and the Rumford Medal in 1842. He sat in the first reformed parliament for two years, for Chippenham, but then retired from politics. In 1832 he married Constance, youngest daughter of the late Mr. Francis Mundy, of Mark-

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eaton, Derbyshire, by whom he has left a family. His death occurred on September 17, 1877, at Lacock Abbey.

Carl Bremiker was born on February 23, 1804, at Hagen in the county of Mark. He at first was educated as a surveyor, and was engaged up to 1835 on the Rhenish-Westphalian survey. In 1835 he went to Berlin in order to devote himself to mathematical and astronomical studies, and with great success, as appears from the fact that he performed the calculations for the important appearance of Encke's Comet in 1838 with such care and accuracy that Encke asserted that more could not have been done. After Bremiker had graduated at the university he became a *collaborateur* on the *Berliner Jahrbuch*, and afterwards Inspector of the Plan Room in the Prussian Ministry of Trade. He proved his high interest in practical astronomy by the observations, continued during many years, that he made at his own residence. As a result of his labours should be mentioned his discovery of a comet on October 26, 1840, for whose orbit the observations gave a period of 344 years with great probability. He also there made the revisions and entries for five of the star charts of the Berlin Academy, which, with the corresponding catalogues, were presented to the Academy: Hora xvii. on December 9, 1839, Hora xiii. on December 6, 1841, Hora xxi. on December 9, 1844, Hora vi. at the end of 1852, and Hora ix. on May 26, 1858. It is well known that, in September 1846, the existence of a new planet beyond *Uranus*, announced by Leverrier, was at once verified by means of Bremiker's Star Chart, Hora xxi., which was lying for correction at the Berlin Observatory.

Bremiker performed a great service by the publication of tables of logarithms arranged in an extremely practical form, and which have found much favour. His *Logarithmorum vi decimalium Nova Tabula Berolinensis* appeared in 1852. In the very valuable introduction of 82 pages there are many important remarks upon the art of exact numerical calculation. In 1856 he issued a corresponding edition of Vega's seven-figure Table, and he also published subsequently four-figure and three-figure tables of logarithms, and finally, in 1872, a five-figure table of logarithms of trigonometrical functions, the degree being divided not into minutes, but into hundredths of a degree, to which are added Gaussian logarithms, a table of squares, &c.

He also published a new and remodelled edition of Crelle's well-known *Rechentafeln*, the whole table being contained in one volume, and in 1843 appeared his *Tafel der Proportionaltheile zum Gebrauche bei logarithmischen Rechnungen*. Since 1850 he edited the *Nautische Jahrbuch* for the use of the German Marine.

In 1868 Bremiker accepted the position of Departmental Director in the Royal Prussian Geodetical Institute, and he has consequently, in the last ten years, taken a very active part in